

PCT/PTO 28 JUL 2005

CLAIMS

(after the 1st Art. 34 Amendment)

1. (Amended) A projection display apparatus comprising:

a first light generating instrument which includes a light source utilizing discharge or filament energization and thereby generates ~~first~~white light;

a second light generating instrument which includes a plural of solid state light sources and thereby generates ~~second~~more than or equal to three kinds of monochromatic light;

a light modulation element which modulates the ~~first~~white light or the ~~second~~monochromatic light;

a light guiding instrument which switches between guiding the ~~first~~white light and the ~~second~~monochromatic light to the light modulation element; and

a projection instrument which projects the light modulated by the light modulation element.

2. (Amended) The projection display apparatus according to claim 1, ~~further comprising:~~

~~— a control instrument which controls at least operation of the light guiding instrument, color wheel including first, second and wherein:~~

~~the control instrument controls the light guiding instrument~~third regions corresponding to guidethree
primary colors of light respectively, the first, second
light and third regions placed to the light modulation
~~element and further controls the light guiding instrument~~
~~after~~be located in a predetermined time to guided the
~~first light to the light modulation element.~~light path
in chronological order by rotation.

3. (Amended) The projection display apparatus
according to claim 2, wherein:

~~the control instrument controls~~in which the second
light modulation element lights up the first light
~~generating instrument and the second light generating~~
~~instruments~~solid light sources selectively so that

~~there is a match between a color corresponding to~~
~~one of the regions of the second~~color wheel located in
a light generating instrument generates the second light
~~while~~path and the color of the light guiding instrument
~~is guiding the second light to the light modulation element,~~
and

~~the first light generating instrument generates the~~
~~first light while the light guiding instrument is guiding~~
~~the first light to the light modulation~~
~~element~~monochromatic light.

4. (Amended) The projection display apparatus according to claim 3, ~~wherein:~~

~~——2, in which the control instrument~~ color wheel further includes a light volume measuring instrument which at least measures region corresponding to white, and stops in a light volume state of having the first light generating instrument, and controls region corresponding to white located in a light path while the monochromatic light is selected by the light guiding instrument to guide the first light to the light modulation element at the time as the predetermined time, when the light volume measured by the light volume measuring instrument becomes equal to or more than a predetermined value.

5. (Amended) The projection display apparatus according to claim 1, ~~further comprising:~~ wherein:

~~—— collection optics for collecting the first light or the second light on the light modulation element, and~~ wherein: the monochromatic light consists of three kinds of light;

the light modulation element includes first, second and third light modulation elements provided correspondingly to the monochromatic light; and

~~the light guiding instrument selectively guides the first light or the second light to the collection optics and thereby guides the first light or the second light selectively to the light modulation element.~~includes:

a first dichroic filter placed on an optical axis of the white light from the first light modulation element;

a first reflecting mirror placed in front of a light incident side of the first light modulation element, a second dichroic filter placed in front of the light incident side of the second light modulation element, and a second reflecting mirror placed on the optical axis of the light transmitted through the first and second dichroic filters of the light from the first light modulation element; and

a third reflecting mirror placed in front of the light incident side of the third light modulation element.

6. (Amended) The projection display apparatus according to claim 5, ~~wherein:~~1, further comprising:

~~— an optical axis of the first light generated by the first light generating instrument between the first light generating instrument and the collection optics is substantially on a straight line; and~~

~~— the optical axis of the second light generated by the second light generating instrument between the second~~

~~light generating instrument and the collection optics is bent via the light guiding instrument.~~

a control instrument which controls at least operation of the light guiding instrument, and wherein:

the control instrument controls the light guiding instrument to guide the monochromatic light to the light modulation element and further controls the light guiding instrument after a predetermined time to guided the white light to the light modulation element.

7. (Amended) The projection display apparatus according to claim 56, wherein:

~~the optical axis of the second light generated by the second light generating instrument between the second light generating instrument and the collection optics is substantially on a straight line; and~~

~~the optical axis of the first light generated by~~
the control instrument controls the first light generating instrument and the second light generating instrument so that

the second light generating instrument generates the monochromatic light while the light guiding instrument is guiding the monochromatic light to the light modulation element, and

~~the first light generating instrument between the first light generating instrument and~~
generates the

~~collection optics is bent via~~white light while the light guiding instrument is guiding the white light to the light modulation element.

8. (Amended) The projection display apparatus according to claim 37, wherein:

~~the first light generating~~control instrument ~~is driven by~~ includes a first power supply based on supply of power from outside;

~~the second generating~~light volume measuring instrument ~~is driven by~~which at least measures a second power supply which is a built-in power supply;

~~the control instrument monitors a status of the first power supply~~light volume of the first light generating instrument, and the second power supply;

~~the control instrument controls the light guiding instrument to guide the second~~white light to the light modulation element ~~irrespective of the state of the first power supply and the second power supply, and exerts control, on detecting that at least the first power supply is supplied with the power from outside,~~at the time as the predetermined time, when the light volume measured by the light volume measuring instrument becomes equal to operate the second light generating instrument and

~~then the first light generating instrument.~~ or more than a predetermined value.

9. (Amended) The projection display apparatus according to claim 1, ~~in which the second light generating instrument is a light emitting diode or a laser diode.~~ 5, further comprising:

collector optics for collecting the white light or the monochromatic light on the light modulation element,
and wherein:

the light guiding instrument selectively guides the white light or the monochromatic light to the collector optics and thereby guides the white light or the monochromatic light selectively to the light modulation element.

10. (Amended) The projection display apparatus according to claim 1, ~~in which the first light generating instrument is a lamp which emits light by arc discharge.~~ 9, wherein:

an optical axis of the white light generated by the first light generating instrument between the first light generating instrument and the collector optics is substantially on a straight line; and

the optical axis of the monochromatic light generated by the second light generating instrument between the

second light generating instrument and the collector optics is bent via the light guiding instrument.

11. (Amended) ~~The projection display apparatus according to claim 1, in which the light guiding instrument includes a mirror surface located between the optical axis of the first light and the optical axis of the second light by rotation or parallel movement.~~9, wherein:

the optical axis of the monochromatic light generated by the second light generating instrument between the second light generating instrument and the collector optics is substantially on a straight line; and

the optical axis of the white light generated by the first light generating instrument between the first light generating instrument and the collector optics is bent via the light guiding instrument.

12. (Amended) ~~An image display method using:~~ The projection display apparatus according to claim 7, wherein:

~~— a first light generating instrument which includes a light source utilizing discharge or filament energization and thereby generates first light;~~

~~—— a second light generating instrument which includes a solid state light source and thereby generates second light;~~

~~—— a light modulation element which modulates the first light or the second light; and~~

~~—— a projection instrument which projects the light modulated by the light modulation element, and wherein:~~

~~—— the method includes a~~ the first light generating instrument is driven by a first power supply based on supply of power from outside;

the second generating instrument is driven by a second power supply which is a built-in power supply;

the control instrument monitors a status of the first power supply and the second power supply;

the control instrument controls the light guiding step of switching between guiding the first light and the second light instrument to guide the light modulation element; and

~~—— the light guiding step guides the second light monochromatic light to the light modulation element and then guides~~ irrespective of the state of the first power supply and the second power supply, and exerts control, on detecting that at least the first light power supply is supplied with the power from outside, to the light modulation element. operate the second light generating

instrument and then the first light generating instrument.

13. (Amended) — ~~A program for causing a computer to function as a control instrument which controls at least operation of the light guiding instrument of the projection display apparatus according to claim 2~~The projection display apparatus according to claim 1, in which the second light generating instrument is a light-emitting diode or a laser diode.

14. (Amended) — ~~A recording medium having the program according to claim 13 recorded thereon and processable by the computer.~~ The projection display apparatus according to claim 1, in which the first light generating instrument is a lamp which emits light by arc discharge.

15. (New) The projection display apparatus according to claim 1, in which the light guiding instrument includes a mirror surface located between the optical axis of the white light and the optical axis of the monochromatic light by rotation or parallel movement.

16. (New) An image display method using:

a first light generating instrument which includes a light source utilizing discharge or filament energization and thereby generates white light;

a second light generating instrument which includes a plural of solid state light sources and thereby generates more than or equal to three kinds of monochromatic light;

a light modulation element which modulates the white light or the monochromatic light; and

a projection instrument which projects the light modulated by the light modulation element, and wherein:

the method includes a light guiding step of switching between guiding the white light and the monochromatic light to the light modulation element; and

the light guiding step guides the monochromatic light to the light modulation element and then guides the white light to the light modulation element.

17. (New) A program for causing a computer to function as a control instrument which controls at least operation of the light guiding instrument of the projection display apparatus according to claim 6.

18. (New) A recording medium having the program according to claim 17 recorded thereon and processable by the computer.

CLAIMS

(after the 2nd Art. 34 Amendment)

1. (Amended) A projection display apparatus comprising:

a first light generating instrument which includes a light source utilizing discharge or filament energization and thereby generates white light;

a second light generating instrument which includes a plural of solid state light sources which generate red, green, and ~~thereby generates more than or equal to three kinds of~~ blue monochromatic light respectively;

a light modulation element which modulates the white light or the monochromatic light;

a light guiding instrument which switches between guiding the white light and the monochromatic light to the light modulation element; and

a projection instrument which projects the light modulated by the light modulation element.

2. (Amended) The projection display apparatus according to claim 1, comprising a color wheel including first, second and third regions corresponding to ~~three primary~~ red, green, and blue colors ~~of light~~ respectively, the first, second and third regions placed to be located in a light path in chronological order by rotation.

3. The projection display apparatus according to claim 2, in which the second light modulation element lights up the solid light sources selectively so that there is a match between a color corresponding to one of the regions of the color wheel located in a light path and the color of the monochromatic light.

4. The projection display apparatus according to claim 2, in which the color wheel further includes a region corresponding to white, and stops in a state of having the region corresponding to white located in a light path while the monochromatic light is selected by the light guiding instrument.

5. (Amended) The projection display apparatus according to claim 1, wherein:

~~the monochromatic light consists of three kinds of light;~~

the light modulation element includes first, second and third light modulation elements provided ~~correspondingly~~ respectively corresponding to solid state light sources of the monochromatic light; and

the light guiding instrument includes:

a first dichroic filter placed on an optical axis of the white light from the first light modulation element;

a first reflecting mirror placed in front of a light incident side of the first light modulation element, a second dichroic filter placed in front of the light incident side of the second light modulation element, and a second reflecting mirror placed on the optical axis of the light transmitted through the first and second dichroic filters of the light from the first light modulation element; and

a third reflecting mirror placed in front of the light incident side of the third light modulation element.

6. The projection display apparatus according to claim 1, further comprising:

a control instrument which controls at least operation of the light guiding instrument, and wherein:

the control instrument controls the light guiding instrument to guide the monochromatic light to the light modulation element and further controls the light guiding instrument after a predetermined time to guided the white light to the light modulation element.

7. The projection display apparatus according to claim 6, wherein:

the control instrument controls the first light generating instrument and the second light generating instrument so that

the second light generating instrument generates the monochromatic light while the light guiding instrument is guiding the monochromatic light to the light modulation element, and

the first light generating instrument generates the white light while the light guiding instrument is guiding the white light to the light modulation element.

8. The projection display apparatus according to claim 7, wherein:

the control instrument includes a light volume measuring instrument which at least measures a light volume of the first light generating instrument, and controls the light guiding instrument to guide the white light to the light modulation element at the time as the predetermined time, when the light volume measured by the light volume measuring instrument becomes equal to or more than a predetermined value.

9. The projection display apparatus according to claim 5, further comprising:

collector optics for collecting the white light or the monochromatic light on the light modulation element, and wherein:

the light guiding instrument selectively guides the white light or the monochromatic light to the collector optics and thereby guides the white light or the

monochromatic light selectively to the light modulation element.

10. The projection display apparatus according to claim 9, wherein:

an optical axis of the white light generated by the first light generating instrument between the first light generating instrument and the collector optics is substantially on a straight line; and

the optical axis of the monochromatic light generated by the second light generating instrument between the second light generating instrument and the collector optics is bent via the light guiding instrument.

11. The projection display apparatus according to claim 9, wherein:

the optical axis of the monochromatic light generated by the second light generating instrument between the second light generating instrument and the collector optics is substantially on a straight line; and

the optical axis of the white light generated by the first light generating instrument between the first light generating instrument and the collector optics is bent via the light guiding instrument.

12. The projection display apparatus according to claim 7, wherein:

the first light generating instrument is driven by a first power supply based on supply of power from outside;

the second generating instrument is driven by a second power supply which is a built-in power supply;

the control instrument monitors a status of the first power supply and the second power supply;

the control instrument controls the light guiding instrument to guide the monochromatic light to the light modulation element irrespective of the state of the first power supply and the second power supply, and exerts control, on detecting that at least the first power supply is supplied with the power from outside, to operate the second light generating instrument and then the first light generating instrument.

13. The projection display apparatus according to claim 1, in which the second light generating instrument is a light-emitting diode or a laser diode.

14. The projection display apparatus according to claim 1, in which the first light generating instrument is a lamp which emits light by arc discharge.

15. The projection display apparatus according to claim 1, in which the light guiding instrument includes a mirror surface located between the optical axis of the white light and the optical axis of the monochromatic light by rotation or parallel movement.

16. An image display method using:

a first light generating instrument which includes a light source utilizing discharge or filament energization and thereby generates white light;

a second light generating instrument which includes a plural of solid state light sources and thereby generates more than or equal to three kinds of monochromatic light;

a light modulation element which modulates the white light or the monochromatic light; and

a projection instrument which projects the light modulated by the light modulation element, and wherein:

the method includes a light guiding step of switching between guiding the white light and the monochromatic light to the light modulation element; and

the light guiding step guides the monochromatic light to the light modulation element and then guides the white light to the light modulation element.

17. A program for causing a computer to function as a control instrument which controls at least operation of the light guiding instrument of the projection display apparatus according to claim 6.

18. A recording medium having the program according to claim 17 recorded thereon and processable by the computer.